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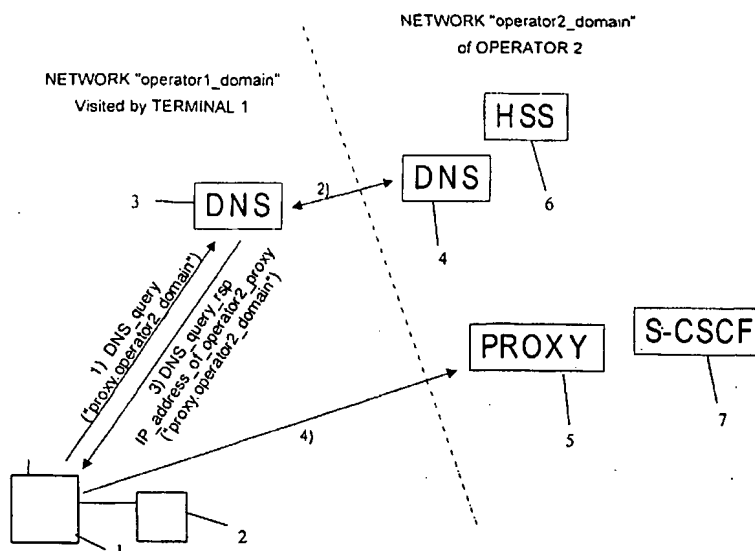
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(54) Title: COMMUNICATION SYSTEM AND METHOD FOR ESTABLISHING A CONNECTION TO A SERVING NETWORK ELEMENT



(57) Abstract: The invention relates to a communication system and method wherein a user equipment contains, or is provided with, a list of items of service-related information. The list of service-related information represents a list of service provider names, services and/or service types or the like. When intending to establish or modify a session or connection or use a service, the user equipment selects, in one of the embodiments, an item from the list and performs a DNS query to resolve the name of the selected item to an IP address which then is used for set-up. The list may be provided by an DHCP server or in a PDP context message. The list may comprise one or more service provider default names, in particular for visited and home networks.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

COMMUNICATION SYSTEM AND METHOD FOR ESTABLISHING
A CONNECTION TO A SERVING NETWORK ELEMENT

FIELD AND BACKGROUND OF THE INVENTION

10 The invention relates to a communication system and method,
and in particular to a system and method allowing a user
equipment such as a terminal, mobile station (MS) or the
like, to get connected to a network element such as an
originating or terminating network element or a network
15 element providing a registration function, e.g. for SIP
(Session Initiation Protocol). Before a user equipment, e.g.
a terminal, can request a registration to a serving network
element such as CSCF (Call State Control Function), e.g. for
getting connected to another network element, it has to find
20 such a serving network element.

The terminal may be adapted to search, when intending to
register, for a proxy network element that helps to find
CSCF. For achieving this function, it might be considered to
25 add a new network element providing e.g. a Location Service.
However, such a new network element increases the network
complexity and overhead.

SUMMARY OF THE INVENTION

30 The invention provides a system as defined in the independent
system claim or any of the dependent system claims.

35 Further, the invention provides a method as defined in the

independent method claim or any of the dependent method claims.

The invention proposes a method and structure enabling a
5 terminal to quickly and easily find a serving network element
such as an initial proxy or CSCF.

A communication system according to one of the preferred
embodiments of the invention preferably comprises at least
10 one user equipment which is adapted to communicate with a
resource designation means to obtain information about
session establishment means available in the communication
system, wherein the user equipment, when intending to
establish a session using one of said session establishment
15 means, includes or is adapted to access a list of items
comprising service-related information and to select an item
from the list. The selected item is used to enquire the
resource designation means to obtain a reference to at least
one session establishment means. The user equipment
20 establishes a session via one of the session establishment
means to which said reference has been obtained.

The session establishment means may be a proxy device. The
resource designation means can be DNS (with proxy being the
25 resource, there can be several resources for the same name
e.g. selected according to a round-robin designation). The
reference to session establishment means may be the address
of the proxy. A session can be a call or video call or other
real-time stream type of communication.

30

It should be appreciated that the term "user equipment" used
in the present application documents, can comprise, for
instance, the mobile equipment (ME), a smart-card inserted to
the mobile equipment (SIM, USIM) and a computer (TE, Terminal
35 Equipment) functionally connected to the mobile equipment

and/or the smart-card. Therefore, when specifying that some information is stored by the user equipment, the information can be stored, in fact, in any of these components or distributed among them. Likewise, if user equipment is
5 performing some functions, these functions can be performed in any of these above mentioned components (ME, SIM or TE).

According to another preferred embodiment of the invention, a communication method and system are provided which comprise
10 at least one user equipment which is adapted to establish a connection to a serving network element for connection to another network element, wherein the user equipment, when intending to establish or modify a connection to the serving or another network element, or a further network element
15 includes, or is adapted to access, a list of service-related information and to select an item from the list, the selected item being used by the user equipment to establish or modify the connection to the serving or the another network element.

20 A subscriber can choose e.g. a proxy from a service-related list (list of items comprising service-related information) such as a list of service providers, or (s)he can use a default service provider. The list may e.g. be stored in the terminal and/or USIM (UMTS Subscriber Identity Module) and/or
25 (prepaid) telephone card.

If proxies are not used, this same structure and method can be utilized to find a supporting network element, e.g. a CSCF, where to register.

30

The invention provides several advantages such as:

- No specialized network element, i.e. Service Location Server, is needed.
- According to one of the preferred implementations of the
35 invention, only standard DNS (Domain Name System) in the

access network is necessary.

- Subscriber may choose whichever service provider, service, service type or alike (s)he wants of the list, even when roaming. That is, the subscriber can utilize e.g. only the access network when roaming in a foreign country, and use her/his own service provider for other services e.g. to save costs.
- Subscribers can easily update the service-related list, e.g. the list of service providers, services, service types or alike. The terminal(s) are preferably adapted to offer that service. The updated list can be saved e.g. in a memory means of the terminal or USIM.
- Use of a telephone card or card of any other type such as a credit card makes it easy to implement e.g. prepaid service using such selection from the service-related list.
- When the terminal is informed on whether it is attached to its home network or roaming outside the home network, it may be adapted to choose a proxy server "home_proxy" of its home network or a proxy server "visited_proxy" of the visited network respectively as default.
- The service-related list may be stored e.g. in the memory of terminals and/or USIMs so that the terminals are able to select a service, service provider or the like before registering or even attaching to a network.
- An access operator may restrict the subscribers to use only its own services by offering only the default to choose in the service-related list of service providers, services, service types or alike.
- Default behaviour preferably is standardized. That is, the access operator may e.g. always offer "visited_proxy" address resolving by DNS (Domain Name System) as well as "home_proxy" address resolving if the operator has own IPT (Internet Protocol Telephony) subscribers.
- Home and roaming subscribers can be handled in separate network elements if desired.

- A subscriber may choose whether (s)he uses the list on the USIM/terminal's memory and/or the list offered e.g. by DHCP server, PDP context, DNS server, some network service or alike.

5 - The invention enables a service provider selection by an end user.

- Further, the invention allows to hide the internal structure of the network, e.g. by making available only a few serving elements such as CSCFs for roamers.

10

Part of the intelligence to find the proxy is preferably provided in or for the terminal (which may have a function to learn whether it is registered in the home or visited network).

15

On the network side, in accordance with one of the preferred implementations of the invention, only two addresses have to be added to DNS database. In this case, no additional network hardware or software is normally needed because the access

20 network usually already comprises DNS. In the terminal some additional software may be provided for storing and handling the list of service-related information such as service providers, and for being able to sort the IP addresses.

25 In other preferred implementations of the invention, methods and systems for finding an initial proxy especially in DHCP (Dynamic Host Configuration Protocol) and PDP (Packet Data Protocol) Context environment are provided. A subscriber can e.g. choose a proxy from a list of service providers,
30 services, service types or alike delivered from one or more DHCP servers and/or in the PDP context and/or from one or more DNS server(s) and/or from one or more separate database(s) and/or from one or more network service(s) and/or alike. The list preferably includes default service
35 providers: "home_proxy" for home subscribers and

"visited_proxy" for roaming subscribers, to be used unless expressly selecting another service provider.

Further, the invention allows to make available only a few
5 serving elements such as CSCFs for roamers. Initial proxies
in the visited network may recognize locally handled calls of
roaming equipments, needing no registration time transfer of
call control to the visited network, just to provide local
services.

10

In addition, different initial proxies can be used for the
roaming subscribers and home subscribers. Such a technique
allows to provide different types of functionality. For
instance, home subscribers can be provided with proxies
15 providing certain services, and roaming, i.e. visiting
terminals can be connected to proxies that have functionality
relating to the routing of calls to local service numbers.
This enables proxy functionality separation. Hence, different
initial proxies can be selected depending on the user
20 "roaming status" (being in its home network or in a visited
network) and different functionalities can be provided in
initial proxies.

The invention furthermore allows to overcome problems related
25 to DHCP+DNS usage by introducing a new DHCP parameter to
specify whether the subscriber requesting the registration is
a roaming or home network subscriber.

30

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an embodiment of the invention and
illustrates a situation in which a service provider or proxy
is explicitly selected by a terminal,

35

Fig. 2 illustrates a method and structure of an embodiment for performing a default selection when the terminal is attached to its home network,

5 Fig. 3 shows a method and structure of an embodiment for performing a default selection when the terminal is roaming, i.e. attached or attaching to a visited network,

10 Fig. 4 shows a method and structure of an embodiment based on DHCP for performing a selection of a service provider, service, or the like, and

Fig. 5 illustrates a registration example primarily but not exclusively related to the embodiment shown in Fig. 1.

15

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

20 Generally, in accordance with one of preferred aspects of the invention, an implementation thereof relates to the registration to an All-IP network or IM CN SS (IP Multimedia Core Network Subsystem) or IM SS (IP Multimedia Subsystem), and the selection of SIP (Session Initiation Protocol)

25 proxies. The basic idea of this aspect is to logically separate the access level, e.g. the GPRS access "plane", and the SIP plane, and to enable a user to select the initial proxy. As an example, in a terminal memory means such as a SIM-card, a service-related list such as a list of possible

30 service providers is configured. The service providers have associated with them a FQDN (Fully Qualified Domain Name). In addition to the service provider domain names, the list contains two defaults: home_proxy and visited_proxy.

35 The service provider FQDNs are used as normal domain names to

find the initial proxy. The initial proxy may have to verify the appropriateness of its use taking account of the users current serving network.

- 5 The default logical names (i.e. home_proxy and visited_proxy) may be resolved in the local DNS to obtain a list of possible proxies. A sorted list is preferably provided in a round-robin fashion from the local DNS. The terminal may apply DNS sortlist directive to sort the addresses according to
10 proximity.

Similarly, a desired service provider can be indicated by the terminal such as MS (Mobile Station) in the DHCP discovery.

- 15 The structure and architecture of the network(s) implementing the invention and network elements may e.g. be in accordance with: "Architecture Principles for Release 2000" (3G TR 23.821 issued by ETSI), and "IP Multimedia (IM) Subsystem - Stage 2" (3G TS 23.228).

20

Preferably, DNS at the access network is used to resolve the FQDNs (Fully Qualified Domain Name) to IP addresses.

- Fig. 1 illustrates a first embodiment of the invention in
25 which a terminal (user equipment) 1 has roamed to a (visited) network "operator1_domain" different from its home network. Terminal 1 is utilizing e.g. only GPRS network as visited network "operator1_domain", and wants to use the service of a service provider such as service operator "Operator2"
30 arranged in another network "operator2_domain" different from the visited network, e.g. in the home network of terminal 1. In Fig. 1, the broken inclined line symbolises the boarder line between the visited network (to the left of the boarder line) and the network of operator2 (to the right
35 of the broken line).

For enabling a selection of the service operator "Operator2", the terminal 1 includes, or is provided with, a list of service-related information (service-related list) in which
5 several service providers and/or other types of service indications are listed. This list is displayed e.g. on a display of the terminal 1. The user (subscriber) of the terminal 1 selects the desired service operator "Operator2" from the displayed list of service operators whereupon the
10 necessary steps for establishing a connection to the selected service provider are performed. This will be described below in more detail.

The above mentioned case where the terminal 1 is provided
15 with a service-related list may correspond to a case where the list may be received from outside of the terminal e.g. from DHCP or PDP context. This case may also apply to the below described embodiments shown in Figs. 2 and 3. Preferably, with the embodiments shown in Figs. 1 to 3, the
20 service-related list is stored in the USIM/terminal's memory. Fig. 4 relates to a more general embodiment where the service-related list is received from outside the terminal. In this case the list may be a list containing several items, or only the default addresses (home_proxy and visited_proxy),
25 or only one of the default addresses according to the status of the subscriber.

The terminal 1 (or equivalently a USIM, UMTS subscriber identity module) is provided with, or has access to, a memory
30 means 2 which may be an internal memory or a SIM (Subscriber Identity Module) card insertable into the terminal 1, or any other insertable memory card, module, equipment or a telephone card or alike. The memory means 2 includes the service-related list of service-related information such as a
35 list of service providers, services, service types or the

like. The list may contain fully qualified domain names (FQDN) of the service providers, services, service types and the like.

- 5 The subscriber chooses one of the items in the list, which, in the embodiment of Fig. 1, is "operator2". The "operator 2" is arranged in a network different from the visited network "operator1_domain" visited by terminal 1. The name attached to the selected "operator2" in the list is e.g. the FQDN name
- 10 "proxy.operator2_domain". Following the selection of the desired service provider, the terminal 1 is adapted, in the embodiment shown in Fig. 1, to perform a DNS query. For this, a message 1) is sent to a DNS server 3 which message "DNS_query" indicates the FQDN name assigned, in the list, to
- 15 the selected item such as "operator2".

- This DNS query of DNS server 3 is performed to learn the IP address of the corresponding proxy which, in the embodiment of Fig. 1, is proxy 5 arranged in the network of operator 2.
- 20 The DNS server 3 normally does not store the IP address of the proxy 5 arranged in a different network, and therefore accesses DNS server 4 provided for the network of operator 2. The DNS server 3 sends the name "proxy.operator2_domain" received from terminal 1 to the DNS server 4 which resolves
- 25 this name to the associated IP address of proxy server 5. The DNS server 4 returns the IP address of proxy 5 to DNS server 3. This information flow between DNS servers 3 and 4 is represented by the double-headed arrow numbered 2).

- 30 In a next step, the DNS server 3 transmits a response (message 3) to the terminal 1 indicating the IP address of the proxy 5 of operator 2 (DNS_query_rsp IP_address_of_operator2_proxy("proxy.operator2_domain")). The terminal 1 is therefore informed on the appropriate IP
- 35 address and addresses proxy 5 by sending a connection or set-

up request 4) to the proxy 5 using the IP address thereof.
The proxy 5 performs the necessary known steps for providing
the services of operator 2 to the terminal 1 by e.g.
informing a serving network element such as Serving Call
5 State Control Function (S-CSCF) 7 to take charge of calls or
connections to or from terminal 1. The necessary information
may be stored in HSS (Home Subscriber Server) 6.

In a case where the DNS server 3 knows the IP address of the
10 service provider, service, service type or the like selected
from the list by the terminal 1 and indicated in message 1),
it may immediately return this IP address to the terminal 1,
without necessity of performing the message exchange 2) with
the DNS server 4 or any other component.

15 Briefly stated, in the embodiment of Fig. 1, the terminal 1
(or USIM) includes or has access to a FQDN list of service
providers. The subscriber chooses a service provider from the
list. A DNS query is performed to learn the IP address of the
20 corresponding proxy. A Registration (or Setup) request is
then sent to that IP address.

The below described Fig. 5 illustrates an example of a
general level information flow related to such a
25 registration.

If the subscriber does not want to choose a service provider,
service, service type or alike from the displayed list, e.g.
the service provider list, a default is preferably used.
30 Subscriber can also explicitly choose the default.
Preferably, there are two defaults: "home_proxy" (for
selection of proxy server of the home network) is used in the
subscriber's home network while "visited_proxy" (for
selection of proxy server of the visited network) is used in
35 all other networks. The terminal and/or the network decides

which one to use.

The "home_proxy" entry specifies the list of proxies available for the home subscribers. The "visited_proxy" entry
5 specifies the list of proxies available for the roaming subscribers. The lists do not have to be equal. This way roamers can be centralized into one or two or a few proxies.

DNS server 3 resolves "home_proxy" and "visited_proxy" as
10 local names i.e. it appends the domain name. The access operator must have "home_proxy" and "visited_proxy" entries in the domain.

Because the access operator administrates DNS, it can conduct
15 the default queries (i.e. home_proxy and visited_proxy) to its own proxy/proxies or to proxies of specialized service operator(s) if the access operator offers only access service (e.g. GPRS network). The load can be shared also among several operators by "round robin" method in DNS. By the same
20 method load can be shared among proxies.

One reason for enquiring the DNS using the default name, lies in the possibility to provide different proxies for different types of subscribers. This is especially true in the case
25 where "visited_proxy" entry specifies the list of proxies available for the roaming subscribers. There could be different proxies in the visited network for the roamers from different networks and different proxies for the subscribers of the same network i.e. own subscribers. For instance,
30 Sonera network in Finland could provide a set of proxies (proxyl, ... , proxyN) for roaming subscribers from any other network and a set of proxies (proxyN+1, ..., proxyK) for its own subscribers, where $N < K$.

35 By having different proxies for own subscribers and roamers

enables different types of proxies to be provided for these categories of subscribers. For instance, for roamers there could be provided special proxies which have functionality relating to the routing of calls to local numbers within the country or countries in the area of which the network is operating. To the contrary, for own subscribers could be provided proxies that straightforwardly set-up the session towards actual serving CSCFs that perform the call routing towards the said local numbers. The rationale for the routing of sessions to actual serving CSCFs could lie, for instance, in the fact that certain services are provided for own subscribers from these CSCFs. Examples of these services are prepaid charging, call screening and various other call set-up related facilities.

15

In a different case certain proxies are dedicated for own subscribers because these proxies contain some initial service processing for services provided for own subscribers.

For instance, the initial proxies for own subscribers could include SIP call processing language scripts that have been downloaded therein. These scripts are executed to provide some service features associated with the sessions set-up through these proxies. Similarly, any other kind of service execution environments can be envisioned to the initial proxies for own subscribers. Therefore, the initial proxies for own subscribers could include means for executing these scripts. The scripts are triggered in the initial proxies based on session set-up information, which is carried, for instance, in the SIP INVITE message. Examples of services, provided using these call processing language scripts include call re-routing, call screening and various other call set-up related facilities. In this kind of a solution only those services that can be executed for the sessions in the proxies are executed there, whereas the rest of the services are

executed using means associated with the serving CSCFs within the home network to which the sessions are set-up from the initial proxies.

5 Figs. 2 and 3 show embodiments for performing a default selection. The explanations with regard to the first embodiment shown in Fig. 1 likewise apply to the embodiments shown in Figs. 2 and 3 as regards structure and functioning thereof.

10

Fig. 2 discloses an embodiment which may be structured in a similar manner as the above-described first embodiment shown in Fig. 1. The elements shown in Fig. 2 are in this embodiment all part of the home network

15 "home_operator_domain" of terminal 1. A proxy server 8 is the home proxy, i.e. a proxy server of the home_network. When the terminal 1 wants to receive a service or get connected to a service provider, the service-related list of service providers or the like is retrieved from the memory 2, or
20 provided to the terminal by another entity. When the user of terminal 1 does not perform any selection from the list, an item set as default value, e.g. default service provider, is selected. This default item is also selected when the user expressly selects this default item.

25

The terminal 1 is adapted to send, as message (1), a query message to DNS server 3' (DNS_Query), indicating the default name "home_proxy". The DNS server 3' may correspond to DNS server 3 or 4 shown in Fig. 1.

30

The DNS server 3' retrieves the IP address of home proxy 8 from its data base, and returns, as message 2), this IP address to the terminal 1. In a next step, the terminal 1 sends a registration (or set-up) message to home proxy 8
35 using its IP address indicated in the response 2), of DNS 3'.

The home proxy 8 then performs a registration (or connection set-up) in the known manner, with S-CSCF 7 being in charge of connection control for connections to and from terminal 1.

5 Fig. 3 shows a structure and functioning of an embodiment of the invention relating to a default selection when roaming, i.e. when the terminal 1 is attached to a network A "operator 1_domain" visited by terminal 1. In Fig. 3, the part left of the broken line represents the components of the visited
10 network A whereas the part to the right of the broken line represents the home network "home_operator_domain" of terminal 1.

The serving CSCF (S-CSCF) 7 shown in Fig. 3 can either be
15 located in the visited network A as shown in Fig. 3, or maybe located in the home network of terminal 1.

When the terminal 1 wants to get connected but does not select any item from the service-related list stored in
20 memory means 2 and displayed on the display of terminal 1 for selection purpose, or when the displayed default proxy of the visited network is expressly selected, the terminal 1 is adapted to send a DNS query to the domain name server DNS 3, indicating the logical name, i.e. the visited_proxy. The DNS
25 server 3 resolves this logical name to the associated IP address of the proxy server 9 of the visited network (VPROXY) and returns, as response to the query message 1), the response message 2) as indicated in Fig. 3. In step 3), the terminal 1 accesses the proxy server 9 of the visited network
30 A using the IP address thereof as returned from DNS server 3. Thereafter, the customary steps for serving the terminal 1, e.g. by the serving CSCF 7, are performed, accessing, if necessary, HSS 6 of the home network of terminal 1.

35 In all or some of the embodiments discloses above and in the

following such as the one shown in Fig. 4, the terminal 1 or the software of terminal 1 may offer a similar service as the sortlist directive of DNS 3, 4 resolver, in order to use always the nearest proxy.

5

Preferably only names of service operators and one or two defaults, e.g. "Default, Sonera, Radiolinja, ..." are displayed on the terminal 1 so that the subscriber can watch and select from these names. The subscriber therefore does not see the FQDNs assigned to the displayed names. The subscriber can preferably also configure the terminal 1 to show or not to show the list of service-related information such as service operators. If the list is not shown, default may be automatically selected and used.

15

In the following, additional methods for finding an initial proxy especially in DHCP (Dynamic Host Configuration Protocol) and/or PDP (Packet Data Protocol) Context environment are described. This is an enhancement to the above described embodiments relying on DNS resolving.

The below described methods are preferably employed when DHCP and/or PDP context is used to find the initial proxy.

25 The list of service-related information such as a list of service providers, services, service types or alike is in this case preferably delivered from one or more DHCP servers and/or in the PDP context and/or from one or more DNS server(s) and/or from one or more separate database(s) and/or from one or more network service(s) and/or alike.

30

A subscriber can choose a proxy from this list sent to the terminal and displayed thereon. The list preferably additionally includes information on service providers to be used as default providers: "home_proxy" for home subscribers

35

and "visited_proxy" for roaming subscribers.

The terminal can be a low-end model that uses automatically the default ("home_proxy" in the home network and
5 "visited_proxy" in the visited network).

DNS at the access network is used to resolve the FQDNs (Fully Qualified Domain Name) to IP addresses.

10 Similar to the above described embodiments, the terminal 1 (or USIM) stores or receives a FQDN list of service providers, services, service types or alike. Subscriber chooses one of the items in the list. DNS query is done to get the IP address of the corresponding proxy. The terminal
15 sends the registration (or set-up) request to that IP address. The above explanations with regard to default selection apply to these embodiments as well.

Because the access operator administrates DHCP and PDP
20 context, it can conduct the default queries (i.e. "home_proxy" and "visited_proxy") to its own proxies or to the proxies of the specialized service operator(s) if the access operator e.g. offers only access service (e.g. GPRS network). The load can be shared also among several operators
25 by "round robin" method in DNS. By the same method load is preferably shared among proxies.

The software of the terminal may offer a similar service as the sortlist directive of DNS resolver, in order to use
30 always the nearest proxy. Terminal 1 may get the configuration directives for the DNS resolver from the same or different source from where it gets the list of service providers, services, service types or alike.

35 The terminal may get the whole list, a part of the list or

one or more separate item(s) of the list automatically, or may actively ask for the whole list, a part of the list or one or more separate item(s) of the list. Separate item(s), a part of the list or the whole list are saved as one or more options in the DHCP server, as RRs (Resource Records) in DNS server, as records in separate database(s), as appropriate entities in some network service(s) or alike from where they are delivered to the terminal in DHCP message(s), in PDP context, as DNS response(s), as responses to database query(ies), as service response(s) or alike.

There shall be a certain redundancy because of the security and service level. In the list of service providers there may be two (or more) "home_proxy" and/or "visited_proxy" items; and/or these items may contain two (or more) addresses; and/or DNS server may offer two (or more) IP addresses for each address.

In the terminal some extra software is preferably provided to handle the list of service providers, services, service types or alike and to be able to sort the IP addresses.

In the following, a DHCP implementation of an embodiment of the invention is described. On the network side DHCP and DNS servers are needed in such a DHCP implementation.

In the embodiment shown in Fig. 4, one (or more) DHCP server 10 is provided. When the terminal 1 intends to get active, e.g. establish a connection to a serving network element such as S-CSCF 7, it sends, as first step 1), a DHCP request to the DHCP server 10. This request of step 1) may e.g. a DHCPDISCOVER packet, in response to which the DHCP server 10 may return DHCPOFFER packet containing a proposed IP address for the terminal 1, the name of the server 10 and its IP address. If accepted by terminal 1, a DHCPREQUEST may be

returned, as part of message exchange step 1), to the server 10. As response 2) thereto, the server 10 may send a DHCPACK response to the terminal 1. This response 2) contains a service-related list such as a list of service providers, services, service types and/or the like.

After having received the list, the terminal 1 performs a selection from this list according to subscriber's selection or corresponding to a default selection in case no other item of the list is designated. Thereafter, the terminal 1 addresses DNS server 3 indicating the selected item such as "visited_proxy", as represented by message 3) of Fig. 4. DNS server 3 returns a response indicating the IP address aside to the visited proxy 9, as represented by response 4).

Thereafter, the terminal 1 sends a registration (or set-up) request 5) to the visited proxy 9 for registration into e.g. a Serving-CSCF 7, i.e. for establishing a connection and being served e.g. by S-CSCF 7.

The steps 3) to 5) of Fig. 4 are essentially identical to the steps 1) to 3) of Fig. 3 (or Figs. 1, 2, apart from the different selected items or proxies).

In the embodiment shown in Fig. 4, "DHCP Option for SIP Servers" (Internet Draft draft-ietf-sip-dhcp-01.txt) may e.g. be used to implement the list as DHCP option(s). If the definitions of this draft are not used, RFC2132 "DHCP Options and BOOTP Vendor Extensions" and RFC2131 "Dynamic Host Configuration Protocol" can be used. Needed items may be stored into one single option, or into a group of options of the same type, or into a group of different types of options.

Others than low-end terminals may be provided with enough intelligence to request the correct option(s) and/or divide the received options into "suboptions" and decode the

concatenated option lists if needed.

A new type of option may also be defined to store item(s).
For low-end terminals it may be enough if they can handle the
5 default i.e. "home_proxy" and "visited_proxy".

There are many ways how an option (a new or an old one) may
be formulated. Besides the normal administrative fields (e.g.
the code):

- 10 a) The option may include two internal fields: the address
class and the address.
- b) The option may include one address class field and several
address fields that contain addresses of that class.
- c) The option may include a list of "address class - address"
15 pairs.
- d) The option may include only an address or several
addresses if the addresses belong to the same class and the
option has an unambiguous code.
- e) Besides the address class and the address fields there may
20 be also other fields, e.g. name field, in the above
alternatives a) to c).

The address class indicates whether the option includes an
address of service provider, service, service type or alike.
25 The address is an address preferably of the type specified
with the address class. The address is an address of an
initial proxy. Fields are separated by character(s) not valid
in the fields themselves.

30 Fields may be fixed length or variable length fields. The
length may be optional if the length can be known otherwise
e.g. when there are only two fixed length fields. Each
address class, or some address classes together, may have an
own option type i.e. an own unambiguous code.

35

Examples:

The home_proxy option may be the following:

"CODE LENGTH home_proxy:cscf4.im.sonera.fi"

5 and the visited_proxy option:

"CODE LENGTH visited_proxy:cscf9.im.sonera.fi"

An option that gives a list of service providers may be:

"CODE LENGTH

10 service_provider:im.sonera.fi,im.radiolinja.fi,im.telia.fi".

An option that gives a list of services may look like:

"CODE LENGTH

15 movies:video.movies.com,video.worldmovies.com;weather:weather
.sonera.fi;sports:video.sports.com,sports.bestmoments.com".

In the following, a PDP context implementation of an embodiment of the invention is explained.

20 In the PDP context there is preferably provided a separate entry for "home_proxy" and "visited_proxy" and also for other list items mentioned above.

In a very simple solution according to one embodiment of the invention, only one of the entries is returned to the terminal based on the knowledge whether the subscriber is a roaming subscriber or a home subscriber.

30 In another solution according to a further embodiment of the invention, both "home_proxy" and "visited_proxy" are returned to the terminal that decides alone or maybe with the help of the network which of them to use.

In an implementation using DNS, no additional component is needed because the access network is usually equipped with

DNS. In the terminal some additional software is provided to handle the list of service providers, services, service types or alike and to be able to sort the IP addresses. A standard DNS structure is sufficient for a DNS implementation of the invention.

In other implementations, the list of service-related information such as a list of service providers, services, service types or alike may be extracted from database(s) local in each network element or offered by specialized or general service(s) in the network and carried to the terminal by an existing and/or a new protocol.

Fig. 5 illustrates a registration example primarily but not exclusively related to the embodiment shown in Fig. 1, with proxy and serving CSCF provided in the home network (operator2 domain) and user being in the visited network (operator1 domain) and not yet being registered. The following registration steps are performed, referring to the numbering shown in Fig. 5.

1. A user equipment (UE) 51 roaming in a visited network sends a message "DNS_query (proxy.operator2_domain)" to the DNS server (vDNS) 52 of the visited network, asking for the address of proxy.operator2_domain.

2a. The vDNS 52 transmits a message "DNS_query (proxy.operator2_domain)" to the DNS server (hDNS) 53 of the home network of the UE 51.

2b. The DNS server (hDNS) 53 returns a message "DNS_query_resp (IP address of proxy.operator2_domain)" indicating the IP address of proxy.operator2_domain.

3. The DNS server vDNS 52 transmits this response message "DNS_query_resp (IP address of proxy.operator2_domain)" to the UE 51.

4. As next step, the UE 51 issues a REGISTER Request to

the indicated IP address, i.e. to the proxy CSCF (P-CSCF) 54.

5. The proxy CSCF (P-CSCF) 54 transmits a REGISTER request to an I-CSCF (Interrogating Call State Control Function) 55.

5 6. Thereupon, a normal registration procedure is performed involving a HSS (Home Subscriber Server) 56 and an S-CSCF (Serving Call State Control Function) 57.

7. and 8. After registration, "OK 200" messages of SIP (Session Initiation Protocol) may be sent from I-CSCF 55 to
10 the P-CSCF 54, and from P-CSCF 54 to the UE 51.

The above described embodiments and solutions may be generalized as follows.

15 For DNS (i.e. Domain Name System) a DNS server is needed. The DNS server does not have to be located in the access network. It can be located in the IM (IP Multimedia) network or in any other network. The terminal has to know the address of a DNS server. The address is preferably stored in the terminal,
20 and/or received from DHCP and/or in the PDP context and/or some other way. The existence of the address of a DNS server means that the domain name service is available for the terminal.

25 The service-related list may partly be stored in the USIM/terminal's memory, on an insertable memory card, module, equipment, on a telephone card, or alike and partly be received from outside of the terminal from one or more DHCP servers and/or in the PDP context and/or from one or more DNS
30 server(s) and/or from one or more separate database(s) and/or from one or more network service(s) and/or alike.

At least the fourth embodiment shown in Fig. 4, the PDP context implementation and the other implementations can be
35 combined with other embodiments such as shown in Figs. 1 to

3. The explanations of the previous paragraphs likewise apply to any such combination.

All embodiments may be implemented so as to comply with only
5 a simple case where the service-related list consists only of
the "default" i.e. home_proxy and visited_proxy. The terminal
deduces by itself and/or with the help of information got
from the network and/or with the help of one or more network
elements whether it is located in the home or a foreign
10 network and utilizes the home_proxy or visited_proxy address
respectively.

The fourth embodiment shown in Fig. 4 may be implemented so
as to comply with a very simple case where DHCP returns only
15 one logical name to the terminal. The logical name is
home_proxy if the terminal is located in its home network
while it is visited_proxy if the terminal is located in a
foreign network. Home_proxy, and respectively visited_proxy,
is a general, well known, preferably standardized logical
20 name that denotes a proxy or a set of proxies reserved for
home subscribers, respectively for visited subscribers. The
terminal resolves the home_proxy (respectively visited_proxy)
logical name with DNS.

25 Because DNS normally appends or can be configured to append
the default domain name to the name in question before
resolving it, the logical names (home_proxy and
visited_proxy) need not be FQDNs but can be simple logical
names. That is why they work in all networks.

30

In the above described embodiments, GPRS is used as access
network. However, GPRS is only an example. The invention can
be used with any other access network too. PDP context and
PDP context activation are concepts used in the GPRS access
35 network. More generally, PDP context can be regarded as a

- communication channel between the access network and the network itself, and the service-related list can be seen as a parameter or a set of parameters of that communication channel. When other access network is used, equivalent, equal
- 5 or similar concepts are used instead, e.g. for providing a communication channel between the access network and the network itself, and the parameter or set of parameters of that communication channel.
- 10 The above described SIP is an example of a usable call control protocol. The invention can also be implemented using any other call control protocol.

CLAIMS

5 1. A communication system comprising at least one user
equipment which is adapted to communicate with a resource
designation means to obtain information about session
establishment means available in the said communication
system, wherein
10 the user equipment, when intending to establish a session
using a session establishment means, includes or is adapted
to access a list of at least one item comprising service-
related information and to select an item from the list or to
pick the item in case the list comprises only one item,
15 said item being used to enquire said resource designation
means to obtain a reference to at least one session
establishment means,
said user equipment being adapted to establish a session via
one of the session establishment means to which the reference
20 has been obtained.

 2. A communication system comprising at least one user
equipment which is adapted to communicate with a resource
designation means to obtain information about session
25 establishment means available in the said communication
system, wherein a network element includes or is adapted to
access a list of items comprising service-related
information, and the user equipment, when intending to
establish a session using a session establishment means, is
30 provided with at least one item selected from the list,
one of said selected items being used to enquire the resource
designation means to obtain a reference to at least one
session establishment means,
the user equipment being adapted to establish a session via
35 one of the session establishment means to which said

reference has been obtained.

3. Communication system according to claim 1 or 2,
wherein the session establishment means is a proxy.

5

4. Communication system according to any one of the
preceding claims, wherein the resource designation means is a
DNS (Domain Name System) server.

10

5. Communication system according to any one of the
preceding claims, wherein a reference to session
establishment means is an address of a proxy.

15

6. Communication system according to any one of the
preceding claims, wherein a session is a call or video call
or other real-time stream type of communication.

20

7. Communication system according to any one of the
preceding claims, wherein the user equipment is adapted to
establish a connection to a serving network element for
connection to another network element.

25

8. Communication system according to any one of the
preceding claims, comprising at least one address translating
network element, the address translating network element
comprising a map mapping a name of an item selected from the
list to an address for accessing an element represented by or
providing the selected item.

30

9. Communication system according to claim 8, wherein
the address translating network element is a Domain Name
System server.

35

10. Communication system according to any one of the
preceding claims, wherein the list of service-related

information comprises or represents a list of service provider names.

11. Communication system according to claim 10, wherein
5 the list of service provider names comprises one or more service provider default names.

12. Communication system according to claim 11, wherein
at least one of the service provider default names is
10 assigned to a service provider provided for a user equipment attached to its home network.

13. Communication system according to claim 11 or 12,
wherein at least one of the service provider default names is
15 assigned to a service provider provided for a roaming user equipment attached to a network different from home network of the user equipment.

14. Communication system according to any one of the
20 preceding claims, wherein the service-related information represents services and/or service types.

15. Communication system according to any one of the
preceding claims, wherein the list includes names of proxy
25 servers.

16. Communication system according to any one of the
preceding claims, wherein the user equipment comprises a
memory means storing the list of service-related information.

30

17. Communication system according to any one of the
preceding claims, wherein the list of service-related
information is stored in a serving network element.

35 18. Communication system according to any one of the

preceding claims, comprising a DHCP network element as a serving network element, the user equipment being adapted to access the DHCP server for receiving the list, or at least one or more items of the list, from the DHCP server.

5

19. Communication system according to any one of the preceding claims, comprising a Serving Call State Control Function (S-CSCF) as a serving network element.

10

20. Communication system according to any one of the preceding claims, wherein the user equipment is adapted to perform a PDP connection, and to receive the list, or at least one or more items of the list, in a PDP-related message.

15

21. A communication method wherein at least one user equipment is adapted to communicate with a resource designation means to obtain information about session establishment means available in the a communication system, wherein

20

the user equipment, when intending to establish a session using a session establishment means, accesses a list of at least one item comprising service-related information and selects an item from the list or picks the item in case the list comprises only one item,

25

said item being used to enquire said resource designation means to obtain a reference to at least one session establishment means,

30

said user equipment establishing a session via one of the session establishment means to which the reference has been obtained.

22. A communication method wherein at least one user equipment is adapted to communicate with a resource designation means to obtain information about session

35

establishment means available in the said communication system, wherein a network element includes or is adapted to access a list of items comprising service-related information, and the user equipment, when intending to
5 establish a session using a session establishment means, is provided with at least one item selected from the list, one of said selected items being used to enquire the resource designation means to obtain a reference to at least one session establishment means,
10 the user equipment to establishing a session via one of the session establishment means to which said reference has been obtained.

23. Communication method according to claim 21 or 22,
15 wherein the session establishment means is a proxy.

24. Communication method according to any one of the preceding method claims, wherein the resource designation means is a DNS (Domain Name System) server.
20

25. Communication method according to any one of the preceding method claims, wherein a reference to session establishment means is an address of a proxy.

25 26. Communication method according to any one of the preceding method claims, wherein a session is a call or video call or other real-time stream type of communication.

27. Communication method according to any one of the
30 preceding method claims, wherein the at least one user equipment is adapted to establish a connection to a serving network element for connection to another network element.

28. Method according to any one of the preceding method
35 claims, wherein at least one address translating network

element comprising a map mapping a name of an item selected from the list to an address for accessing an element represented by or providing the selected item, the translated address translating network element sending the address of
5 the selected item to the user equipment.

29. Method according to claim 28, wherein the address translating network element is a Domain Name System server.

10 30. Method according to any one of the preceding method claims, wherein the list of service-related information comprises or represents a list of service provider names.

31. Method according to claim 30, wherein the list of
15 service provider names comprises one or more service provider default names.

32. Method according to claim 31, wherein at least one of the service provider default names is assigned to a
20 service provider provided for a user equipment attached to its home network.

33. Method according to claim 31 or 32, wherein at least one of the service provider default names is assigned to a
25 service provider provided for a roaming user equipment attached to a network different from home network of the user equipment.

34. Method according to any one of the preceding method
30 claims, wherein the service-related information represents services and/or service types.

35. Method according to any one of the preceding method claims, wherein the list includes names of proxy servers.

35

36. Method according to any one of the preceding method claims, wherein the user equipment comprises a memory means storing the list of service-related information.

5 37. Method according to any one of the preceding method claims, wherein the list of service-related information is stored in a serving network element.

10 38. Method according to any one of the preceding method claims, comprising a DHCP server as a serving network element, the user equipment being adapted to access the DHCP server for receiving the list, or at least one or more items of the list, from the DHCP server.

15 39. Method according to any one of the preceding method claims, comprising a Serving Call State Control Function (S-CSCF) as a serving network element.

20 40. Method according to any one of the preceding method claims, wherein the user equipment is adapted to perform a PDP connection, and to receive the list, or at least one or more items of the list, in a PDP-related message.

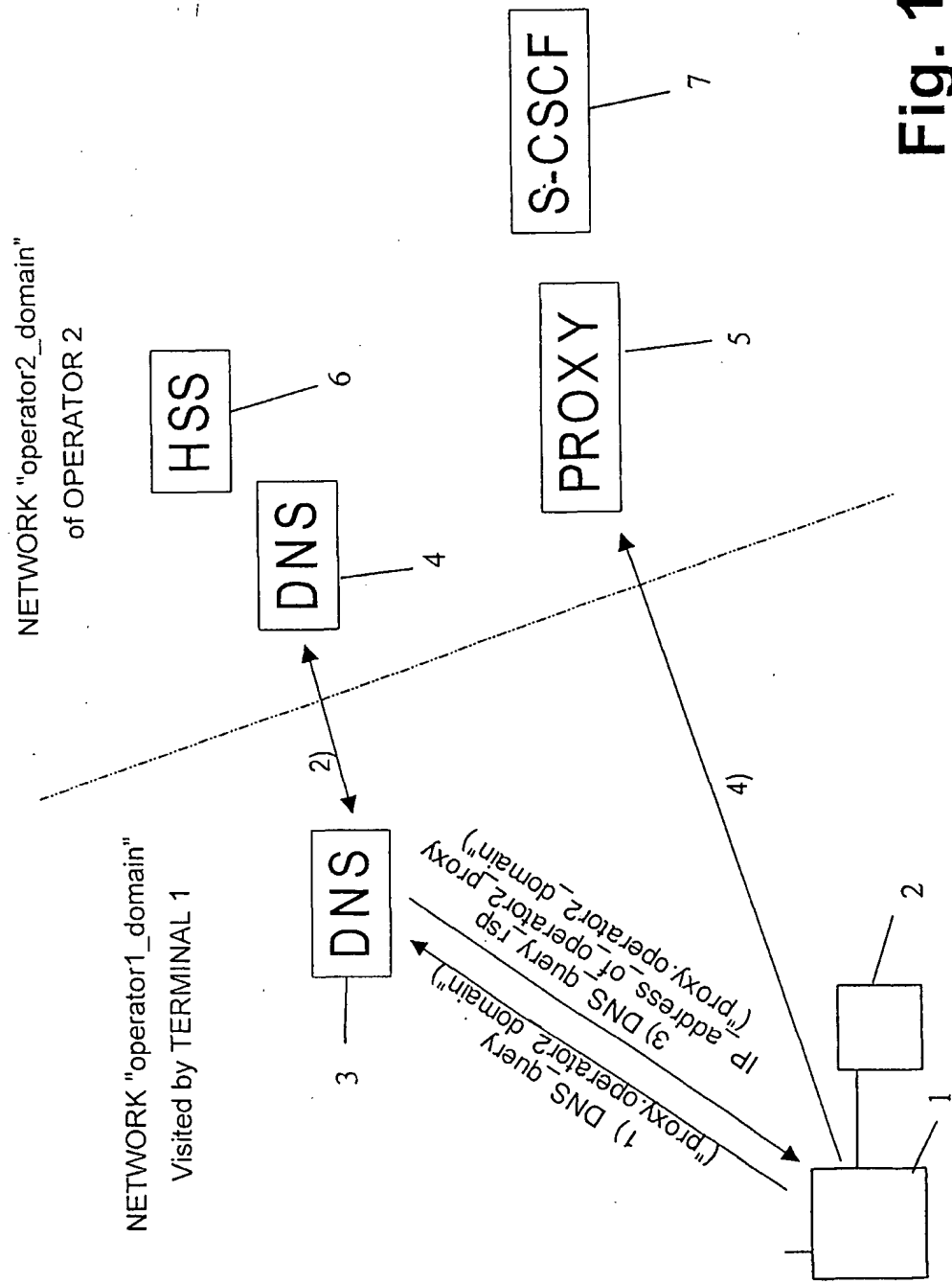


Fig. 1

HOME NETWORK
"home_operator_domain"
OF TERMINAL 1

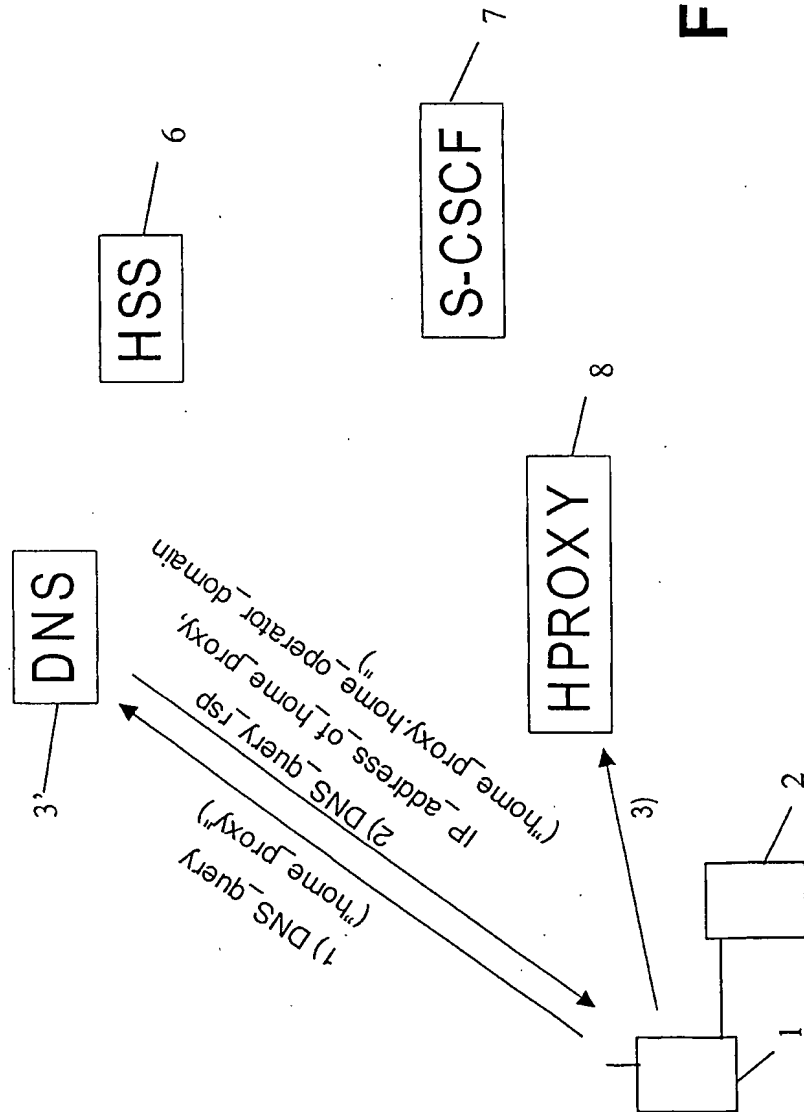


Fig. 2

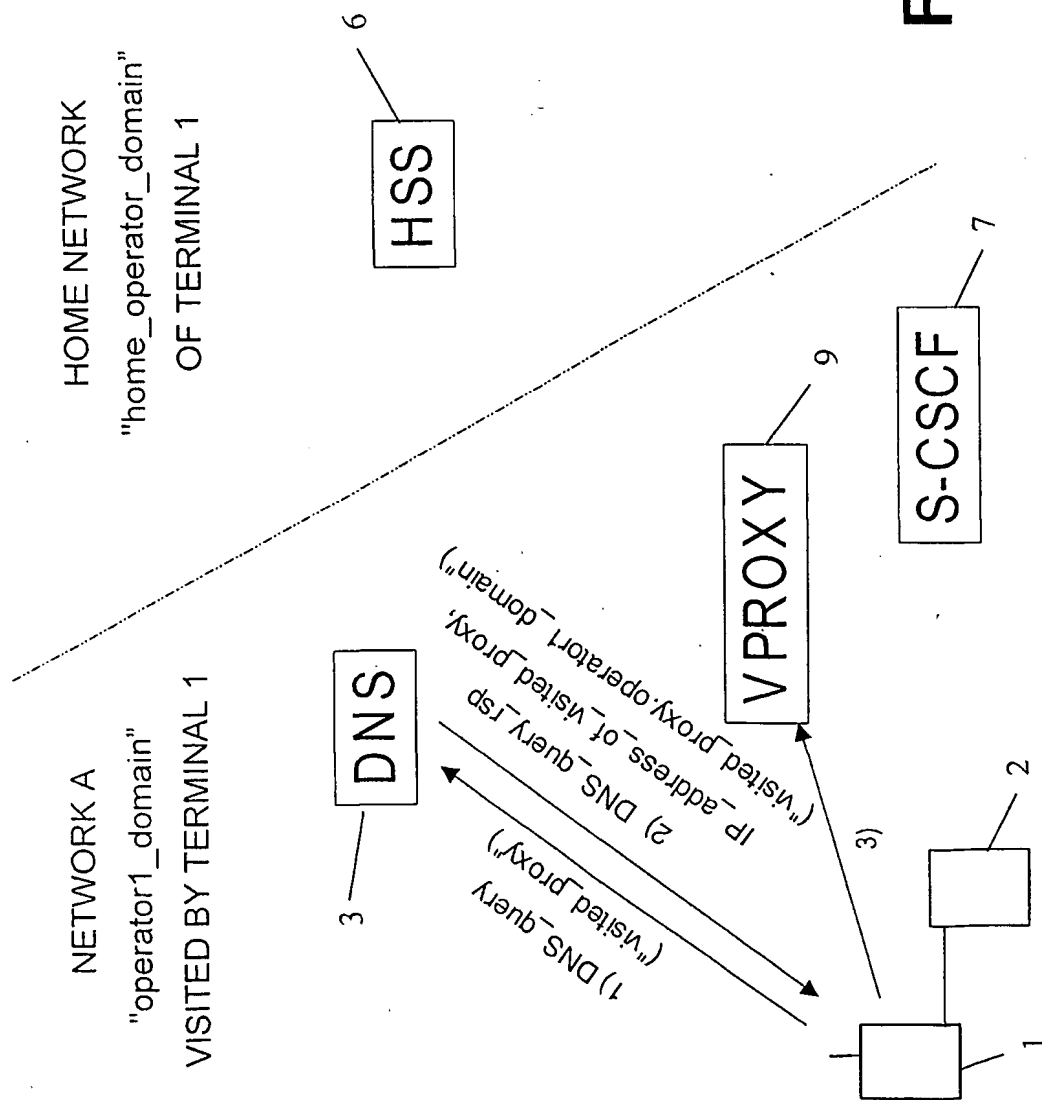


Fig. 3

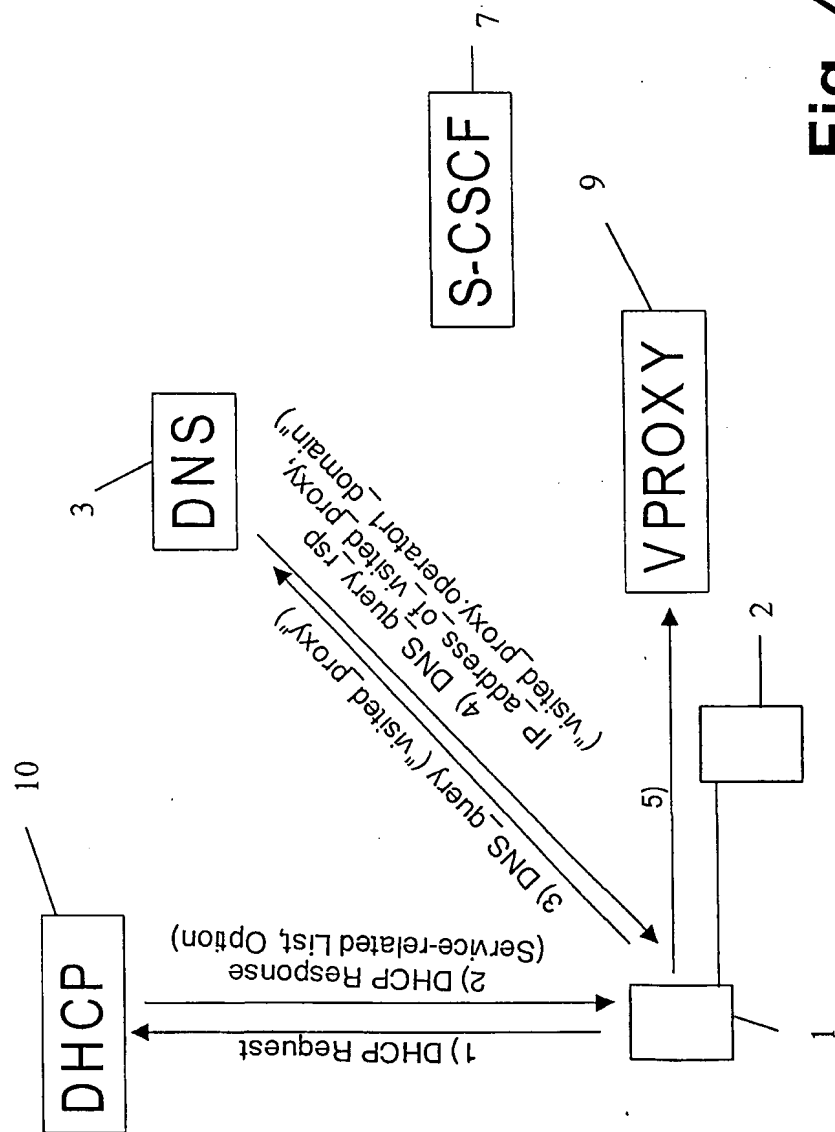


Fig. 4

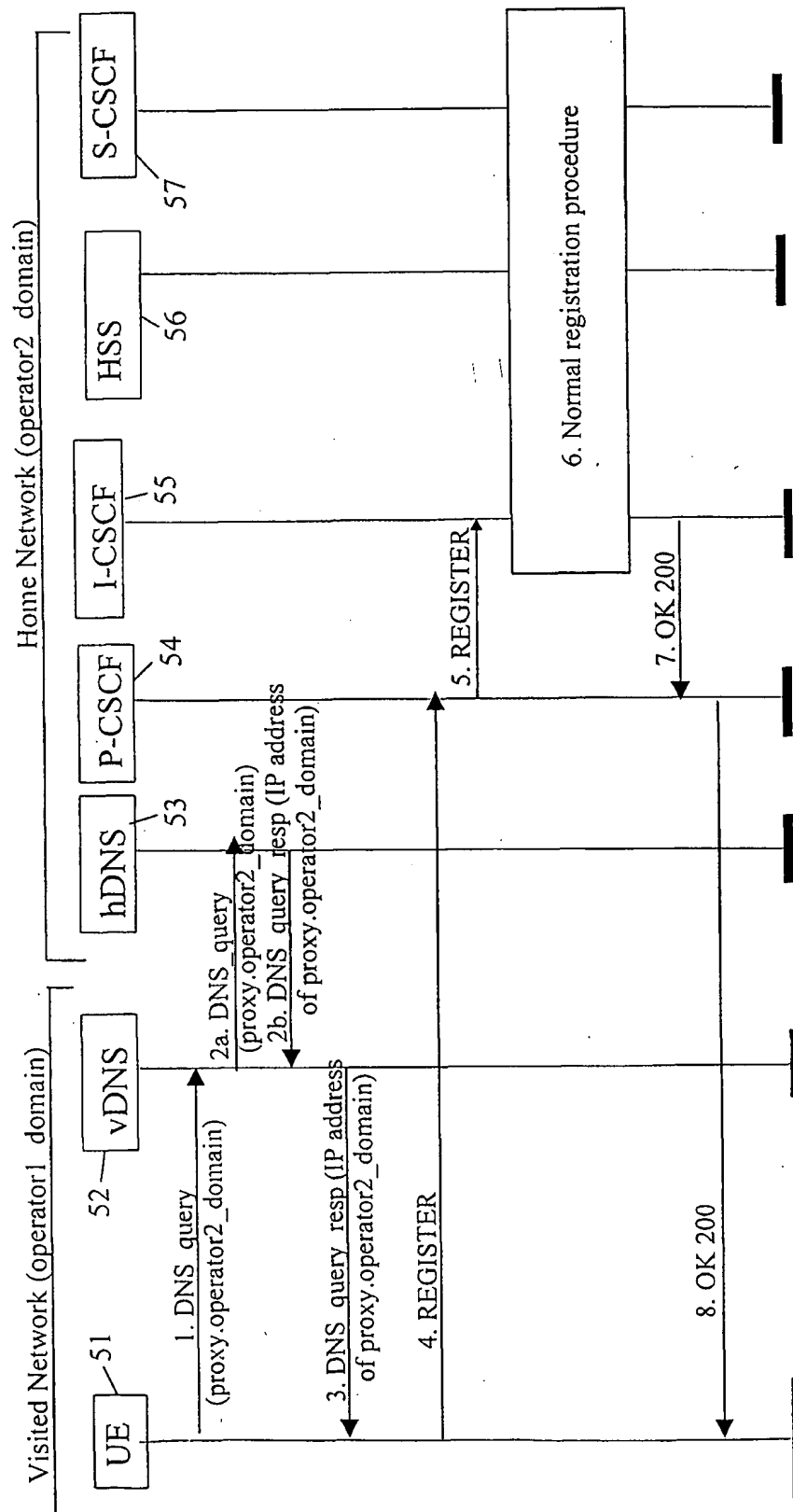


Fig. 5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/12171

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H04Q7/38 H04L12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 00 70901 A (ERICSSON INC) 23 November 2000 (2000-11-23)</p> <p>abstract page 8, line 2 - line 19 page 9, line 12 - line 15 page 10, line 12 - page 11, line 5 figures 1,3,5</p> <p style="text-align: center;">---</p> <p style="text-align: center;">-/--</p>	<p>1,6,14, 16,21, 26,34,36</p>

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

1 October 2001

Date of mailing of the international search report

09/10/2001

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/12171

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 118 768 A (BHATIA RAJIV ET AL) 12 September 2000 (2000-09-12) abstract figures 1,4B,10,12A,12B,13A,13B column 5, line 66 -column 6, line 19 column 11, line 59 -column 12, line 7 column 18, line 12 - line 65 column 30, line 38 -column 31, line 31 column 32, line 6 - line 56 column 39, line 37 - line 44 -----	2,4,6, 8-10,17, 18,22, 24,26, 28-30, 37,38
X	US 5 761 618 A (LYNCH RICHARD ET AL) 2 June 1998 (1998-06-02) abstract figures 5,7 column 8, line 45 -column 9, line 57 -----	1,10,11, 13,21, 30,31,33

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/12171

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0070901	A	23-11-2000	AU 4999700 A WO 0070901 A1	05-12-2000 23-11-2000
US 6118768	A	12-09-2000	NONE	
US 5761618	A	02-06-1998	NONE	